

THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Carr et al.

Serial No.: 10/733,847

Filed: 12/10/2003

Title: Methods for high-fidelity production  
of long nucleic acid molecules

Attorney Docket No.: 056754/0124079

Group Art Unit: 1634

Examiner: Lu, Frank Wei Min

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT**

Dear Sir:

This Information Disclosure Statement is submitted:

- ☒ under 37 CFR 1.97(b), or  
(Within three months of filing national application; or date of entry of international application; or **before mailing date of first office action on the merits**; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:  
☐ Statement under 37 CFR 1.97(e), or  
☐ a \$180.00 fee under 37 CFR 1.17(p), or  
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)
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☒ Applicant(s) submit herewith Form PTO 1449-Information Disclosure Citation together with copies of patents, publications, or other information of which applicant(s) are aware, which

applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56.

Certain of the references disclosed herein were cited in an International Search Report issued in the counterpart PCT application to the present application and/or in an International Search Report issued in the counterpart PCT application to the copending application cited in the Specification of the present application.


It is respectfully requested that the information disclosed herein be made of record in this application.

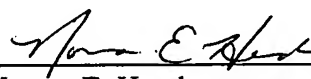
Respectfully submitted,

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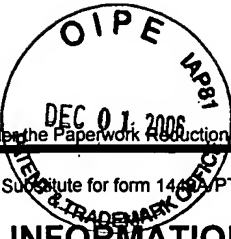
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Norma E. Henderson  
Attorney/Agent for Applicant(s)  
Reg. No. 39219

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

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Application Number	10/733,847
Filing Date	12/10/2003
First Named Inventor	Carr et al.
Art Unit	1634
Examiner Name	Lu, Frank Wei Min
Attorney Docket Number	056754/0124079

Sheet

1

of

8

**U.S. PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code <sup>2</sup> (if known)			
	P1	US-5459039	10-17-1995	Modrich et al.	
	P2	US-5556750	09-17-1996	Modrich et al.	
	P3	US-5679522	10-12-1997	Modrich et al.	
	P4	US-5702894	12-30-1997	Modrich et al.	
	P5	US-5707806	01-13-1998	Shuber	
	P6	US-5858754	01-12-1999	Modrich et al.	
	P7	US-5861482	01-19-1999	Modrich et al.	
	P8	US-5877280	03-02-1999	Wetmur	
	P9	US-5922539	07-13-1999	Modrich et al.	
	P10	US-6008031	12-28-1999	Modrich et al.	
	P11	US-6365355	04-02-2002	McCutchen-Maloney	
	P12	US-6521427	02-18-2003	Evans	
	P13	US-20030138782-A1	07-24-2003	Evans	
	P14	US-6613513	09-02-2003	Parce et al.	
	P15	US-20030171325-A1	09-11-2003	Gascoyne	
	P16	US-6632641	10-14-2003	Brennan et al.	
	P17	US-20030228602-A1	12-11-2003	Parker et al.	
	P18	US-6670127	12-30-2003	Evans	
	P19	US-6673552	01-06-2004	Frey	

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> - Number <sup>4</sup> - Kind Code <sup>5</sup> (if known)				
	FP1	WO 03/054232 - A2	07-03-2003	Blue Heron Biotechnology, Inc.		
	FP2	EP 1 314 783 - A1	11-22-2001	Sloning BioTechnology GmbH		

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<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)				Application Number	10/733,847
				Filing Date	12/10/2003
				First Named Inventor	Carr et al.
				Art Unit	1634
				Examiner Name	Lu, Frank
Sheet	2	of	8	Attorney Docket Number	056754/0124079

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>	
	NP1	ALEXEYEV, Mikhail F. et al., "Gene synthesis, bacterial expression and purification of the Rickettsia prowazekii ATP/ADP translocase", Biöchimica et Biophysica Acta 1419, 299-306 (1999).		
	NP2	AMBLARD, Francois et al., "A magnetic manipulator for studying local rheology and micromechanical properties of biological systems", Rev. Sci. Instrum. 67 (3), 818-827 (March 1996).		
	NP3	ASSI, Fabiano et al., "Massively parallel adhesion and reactivity measurements using simple and inexpensive magnetic tweezers", J. Appl. Phys., Vol. 92, No. 9, 5584-5586 (1 Nov. 2002).		
	NP4	AU, Lo-Chun et al., "Gene synthesis by a LCR-based approach : high level production of Leptin-L54 using synthetic gene in Escherichia coli", Biochemical and Biophysical Research Communications 248, 200-203 (1998).		
	NP5	BAEDEKER, Mathias et al., "Overexpression of a designed 2.2kb gene of eukaryotic phenylalanine ammonia-lyase in Escherichia coli", FEBS Letters 457, 57-60 (1999).		
	NP6	BEAUCAGE, Sege L. et al., "The Chemical synthesis of DNA/RNA".		
	NP7	BEAULIEU, Martin et al., "PCR candidate region mismatch scanning: adaptation to quantitative, high-throughput genotyping", Nucleic Acids Research, Vol. 29, No. 5, 1114-1124 (2001).		
	NP8	BISWAS, Indranil et al., "Identification and characterization of a thermostable MutS homolog from Thermus aquaticus", The Journal of Biological Chemistry, Vol. 271, No. 9, 5040-5048, (1 Mar. 1996)		
	NP9	BISWAS, Indranil et al., "Interaction of MutS protein with the major and minor grooves of a heteroduplex DNA", The Journal of Biological Chemistry, Vol. 272, No. 20, 13355-13364, (16 May 1997)		
	NP10	BJORNSEN, Keith P. et al., "Differential and simultaneous adenosine Di- and Triphosphate binding by MutS", The Journal of Biological Chemistry, Vol. 278, No. 20, 18557-18562, (16 May 2003)		
	NP11	CASMIRO, Danilo R. et al., "PCR-based gene synthesis and protein NMR spectroscopy", Structure, Vol. 5, No. 11, 1407-1412 (1997).		

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	NP12	CELLO, Jeronimo et al., "Chemical synthesis of poliovirus cDNA : Generation of infectious virus in the absence of natural template", Science, Vol. 297, 1016-1018 (9 Aug. 2002).	
	NP13	CHALMERS, Felicity M. et al., "Scaling up the ligase chain reaction-based approach to gene synthesis", BioTechniques, Vol. 30, No. 2, 249-252 (2001).	
	NP14	CUTLER, David J. et al., "High-throughput variation detection and genotyping using microarrays", Genome Research 11:1913-1925 (2001).	
	NP15	DEAMER, David W. et al., "Characterization of nucleic acids by nanopore analysis", Acc. Chem. Res., Vol. 35, No. 10, 817-825 (2002).	
	NP16	DIETRICH, Rudiger et al., "Gene assembly based on blunt-ended double-stranded DNA-modules", Biotechnology Techniques, Vol. 12, No. 1, 49-54 (Jan. 1998).	
	NP17	EISEN, Jonathan A., "A phylogenomic study of the MutS family of proteins", Nucleic Acids Research, Vol. 26, No. 18, 4291-4300 (1998).	
	NP18	FEDORYAK, Olesya D. et al., "Brominated hydroxyquinoline as a photolabile protecting group with sensitivity to multiphoton excitation", Or. Lett., Vol. 4, No. 20, 3419-3422 (2002).	
	NP19	GALNEDER, R. et al., "Microelectrophoresis of a bilayer-coated silica bead in an optical trap: application to enzymology", Biophysical Journal, Vol. 80, No. 5, 2298-2309 (May 2001).	
	NP20	GAO, Xiaolian et al., "A flexible light-directed DNA chip synthesis gated by deprotection using solution photogenerated acids", Nucleic Acids Research, Vol. 29, No. 22, 4744-4750 (2001).	
	NP21	GARBOW, Norbert et al., "Optical tweezing electrophoresis of isolated, highly charged colloidal spheres", Colloids and Surfaces A: Physicochem. Eng. Aspects 195, 227-241 (2001).	
	NP22	GOSSE, Charlie et al. "Magnetic tweezers: micromanipulation and force measurement at the molecular level", Biophysical Journal, Vol. 82, 3314-3329 (June 2002). GOSSE, Charlie et al. "Magnetic tweezers: micromanipulation and force measurement at the molecular level", Biophysical Journal, Vol. 82, 3314-3329 (June 2002).	

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	NP23	HABER, Charbel et al., "Magnetic tweezers for DNA micromanipulation", Rev. Sci. Instrum., Vol. 71, No. 12, 4561-4570 (Dec. 2000).	
	NP24	HECKER, Karl H. et al., "Error analysis of chemically synthesized polynucleotides", BioTechniques, Vol. 24, No. 2, 256-260 (1998).	
	NP25	HOOVER, David M. et al., "DNAWorks : an automated method for designing oligonucleotides for PCR-based gene synthesis", Nucleic Acids Research, Vol. 30, No. 10 (2002).	
	NP26	HOSU, Basarab G. et al., "Magnetic tweezers for intracellular applications", Rev. Sci. Instrum., Vol. 74, No. 9, 4158-4163 (Sept. 2003).	
	NP27	HUANG, Hayden et al., "Three-dimensional cellular deformation analysis with a two-photon magnetic manipulator workstation", Biophysical Journal, Vol. 82, No. 4, 2211-2223 (Apr. 2002).	
	NP28	JACKSON, Brian A. et al., "Recognition of DNA base mismatches by a rhodium intercalator", J. Am. Chem. Soc., 119, 12986-12987 (1997).	
	NP29	KE, Song-Hua et al., "Influence of neighboring base pairs on the stability of single base bulges and base pairs in a DNA fragment", Biochemistry, Vol. 34, 4593-4600 (1995).	
	NP30	KELLEY, Shana O. et al., "Single-base mismatch detection based on charge transduction through DNA", Nucleic Acids research, Vol. 27, No. 24, 4830-4837 (1999).	
	NP31	KIM, Yang-Gyun et al., "Chimeric restriction endonuclease", Proc. Natl. Acad. Sci., Vol. 91, 883-887 (Feb. 1994).	
	NP32	KIM, Yang-Gyun et al., "Site-specific cleavage of DNA-RNA hybrids by zinc finger/FokI cleavage domain fusions", Gene, 203, 43-49 (1997).	
	NP33	KIM, Yang-Gyun, "The interaction between Z-DNA and the Zab domain of double-stranded RNA adenosine deaminase characterized using fusion nucleases", The Journal of Biological Chemistry, Vol. 274, No. 27, 19081-19086 (1999).	

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	NP34	KOPP, Martin U. et al., "Chemical amplification: continuous-flow PCR on a chip", Science, Vol. 280, 1046-1048 (15 May 1998).	
	NP35	LAGALLY, E.T. et al., "Single-molecule DNA amplification and analysis in an integrated microfluidic device", Anal. Chem., 73, 565-570 (2001).	
	NP36	LAHUE, R.S. et al., "DNA mismatch correction in a defined system", Science, Vol. 425, No. 4914 160-164 (14 July 1989).	
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	NP38	LANG, Matthew J. et al., "An automated two-dimensional optical force clamp for single molecule studies", Biophysical Journal, Vol. 83, 491-501 (July 2002).	
	NP39	LEE, C.S. et al., "Microelectromagnets for the control of magnetic nanoparticles", Appl. Phys. Lett., Vol. 79, No. 20, 3308-3310 (12 Nov. 2001).	
	NP40	LI, Lin et al., "Functional domains in Fok I restriction endonuclease", Proc. Natl. Acad. Sci. USA, Vol. 89, 4275-4279 (May 1992).	
	NP41	LIPSHUTZ, Robert J. et al., "High density synthetic oligonucleotide arrays", Nature Genetics Supplement, Vol. 21, 20-24 (Jan. 1999).	
	NP42	LISHANSKI, Alla et al., "Mutation detection by mismatch binding protein, MutS, in amplified DNA : application to the cystic fibrosis gene", Proc. Natl. Acad. Sci. USA, Vol. 91, 2674-2678 (March 1994).	
	NP43	LU, A.-Lien et al., "Methyl-directed repair of DNA base-pair mismatches in vitro", Proc. Natl. Acad. Sci. USA, Vol. 80, 4639-4643 (Aug. 1983).	
	NP44	MCGALL, Glenn H. et al., "The efficiency of light-directed synthesis of DNA arrays on glass substrates", J. Am. Chem. Soc., Vol. 119, No. 22, 5081-5090 (4 June 1997).	

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	NP45	MULLER, Caroline et al., "Protection and labelling of thymidine by a fluorescent photolabile group", Helvetica Chimica Acta, Vol. 84, 3735-3741 (2001).	
	NP46	NAKATANI, Kazuhiko et al., "Recognition of a single guanine bulge by 2-Acylamino-1,8-naphthyridine", J. Am. Chem. Soc., 122, 2172-2177 (2000).	
	NP47	PELLOIS, Jean P. et al., "Individually addressable parallel peptide synthesis on microchips", Nature Biotechnology, Vol. 20, 922-926 (Sept. 2002).	
	NP48	RUMINY, Philippe et al., "Long-range identification of hepatocyte nuclear factor-3 (FoxA) high and low-affinity binding sites with a chimeric nuclease", J. Mol. Biol., 310, 523-535 (2001).	
	NP49	SACCONI, L. et al., "Three-dimensional magneto-optic trap for micro-object manipulation", Optics Letters, Vol. 26, No. 17, 1359-1361 (1 Sept. 2001).	
	NP50	SCHMALZING, Dieter et al., "Microchip electrophoresis: a method for high-speed SNP detection", Nucleic Acids research, Vol. 28, No. 9 (2000).	
	NP51	SIERZCHALA, Agnieszka B. et al., "Solid-phase oligodeoxynucleotide synthesis : a two-step cycle using peroxy anion deprotection", J. Am. Chem. Soc., Vol. 125, No. 44, 13427-13441 (2003).	
	NP52	SINGH-GASSON, Sangeet et al., "Maskless fabrication of light-directed oligonucleotide microarrays using a digital micromirror array", Nature Biotechnology, Vol. 17, 974-978 (Oct. 1999).	
	NP53	SMITH, Jane et al., "Mutation detection with Muth, MutL, and MutS mismatch repair proteins", Proc. Natl. Acad. Sci. USA, Vol. 93, 4374-4379 (April 1996).	
	NP54	SMITH, Jane et al., "Removal of polymerase-produced mutant sequences from PCR products", Proc. Natl. Acad. Sci. USA, Vol. 94, 6847-6850 (June 1997).	
	NP55	SMITH, Steven B. et al., "Direct mechanical measurements of the elasticity of single DNA molecules using magnetic beads", Science, Vol. 258, 1122-1126 (13 Nov. 1992).	

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

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Sheet

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of

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Application Number	10/733,847
Filing Date	12/10/2003
First Named Inventor	Carr et al.
Art Unit	1634
Examiner Name	Lu, Frank
Attorney Docket Number	056754/0124079

**NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
	NP56	STEMMER, Willem P.C. et al., "Single-step assembly of a gene and entire plasmid from large numbers of oligodeoxyribonucleotides", Gene, Vol. 164, 49-53 (1995).	
	NP57	TANASE, M. et al., "Magnetic trapping of multicomponent nanowires" (25 June 2001).	
	NP58	VISSCHER, Koen et al., "Construction of multiple-beam optical traps with nanometer-resolution position sensing", IEEE Journal of Selected Topics in Quantum Electronics, Vol. 2, No. 4, 1066-1076 (Dec. 1996).	
	NP59	VOLDMAN, Joel et al., "Holding forces of single-particle dielectrophoretic traps", Biophysical Journal, Vol. 80, No. 1, 531-541 (Jan. 2001).	
	NP60	WAH, David A. et al., "Structure of the multimodular endonuclease FokI bound to DNA", Nature, Vol. 388, 97-100 (3 July 1997).	
	NP61	WAH, David A. et al., "Structure of FokI has implications for DNA cleavage", Proc. Natl. Acad. Sci. USA, Vol. 95, 10564-10569 (Sept. 1998).	
	NP62	WHITEHOUSE, Adrian et al., "Analysis of the mismatch and insertion/deletion binding properties of Thermus thermophilus, HB8, MutS", Biochemical and Biophysical Research Communications, Vol. 233, 834-837 (1997).	
	NP63	WIRTZ, Denis, "Direct measurement of the transport properties of a single DNA molecule", Physical Review Letters, Vol. 75, No. 12, 2436-2439 (18 Sept. 1995).	
	NP64	WITHERS-MARTINEZ, Chrislaine et al., "PCR-based gene synthesis as an efficient approach for expression of the A + T-rich malaria genome", Protein Engineering, Vol. 12, No. 12, 1113-1120 (1999).	
	NP65	WOOD, Richard D. et al., "Human DNA repair genes", Science, Vol. 291, 1284-1289 (16 Feb. 2001).	
	NP66	WU, Xing-Zheng et al., "An improvement of the on-line electrophoretic concentration method for capillary electrophoresis of proteins and experimental factors affecting the concentration effect", Analytical Sciences, Vol. 16, 329-331 (March 2000).	

Examiner Signature	Date Considered
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